

Diarrhea outpatient and inpatient utilization and cost accumulation among children under five by birth weight category in Indonesia: an analysis of BPJS Kesehatan sample data

Latifah Alifiana Rahmawati^{1*}, Atik Nurwahyuni¹

Abstract

Purpose: This study aims to determine the number of outpatient and inpatient diarrhea cases, the duration of hospital stays, and the accumulated cost of claims paid to health facilities for diarrhea treatment by birth weight category among children under five. We collected this data from the referral health facility (FKRTL) using the Indonesian Social Security Agency for Health (BPJS Kesehatan) Sample Data from 2017-2022. **Methods:** This retrospective cohort design uses BPJS Health Sample Data from 2017-2022, merged with the Water Quality Index from the Ministry of Environment and Forestry Report. Using negative binomial regression, we calculated the rate ratio of the number of outpatient and inpatient cases and the duration of hospital stays. We estimated the cost accumulation using Gamma Regression. **Results:** The subjects of this study were 3,175 children born in 2017. Among these, 493 (15.53%) were low birth weight children. The average number of outpatient and inpatient diarrhea visits, the duration of hospital length of stay, and the accumulated costs of diarrhea treatment were higher in low birth-weight children than in normal birth-weight children. A strong association existed between low birth weight, the number of outpatient cases, and the length of hospital stays. **Conclusion:** Birth weight, gender, membership segment, treatment class, area of residence, and water quality index significantly influenced the number of outpatient visits for children aged 0 to 5 years at FKRTL caused by diarrhea.

Keywords: birth weight; cost accumulation; diarrhea; under-five children; utilization

Submitted:

June, 19th 2024

Accepted:

July, 10th 2024

Published:

July, 12th 2024

¹Faculty of Public Health,
Universitas Indonesia,
Indonesia

*Correspondence:

latifah.alifiana@gmail.com

INTRODUCTION

Infectious diseases are still a burden of health problems in the world [1]. Infectious diseases caused 5 million deaths in children under five years old in 2021.

Globally, infectious diseases, including pneumonia, diarrhea, and malaria, are still the leading causes of under-five deaths, along with premature birth and intrapartum complications [2]. Pneumonia caused 14% of deaths, or 740,180 children under five, in 2019 [3].

Diarrhea is the second most common cause of death for children under five, resulting in the deaths of 525,000 children under five every year [4]. In Indonesia, based on 2018 Basic Health Research (Riskesdas) data, upper respiratory tract infections (ARI) in children under five had a prevalence of 12.8%, diarrhea prevalence of 12.3%, and pneumonia prevalence of 4.8% [5]. Pneumonia and diarrhea are also the leading causes of under-five deaths in Indonesia in 2022, accounting for 12.5% of pneumonia and 5.8% of diarrhea [6].

Diarrhea causes the most significant number of deaths among children under five in Indonesia. Several factors cause diarrhea, including a birth weight of fewer than 2,500 grams or low birth weight (LBW) [7]. Every 500-gram reduction in birth weight can increase the incidence rate ratio of hospitalized diarrhea in children by 1.1 times [8]. Children with a history of LBW also experienced 33% more days with diarrhea than children born with a normal body weight [9]. Lower immune function in LBW newborns is the root cause, making them more susceptible to infectious diseases, such as diarrhea [10]. According to UNICEF data, in 2020, 19.8 million or 14.7% of babies born with low birth weight worldwide [11]. Based on the 2018 Indonesia Basic Health Survey (Riskesdas) data, the proportion of children born with a weight <2,500 grams is 6.2% [5]. According to Indonesian Health Profile data, in 2022, 3.3% of babies will be born with low birth weight out of 79.2% of babies born who are weighed. The number increased compared to 2021; 2.5% of LBW babies out of 81.8% of babies weighed [6].

Studies mention the relationship between LBW history and the incidence of malnutrition, such as stunting, wasting, and underweight [12,13]. Malnutrition in under-five children impacts physiological disorders, metabolism [14], decreased immunity and wound healing, and psychosocial impacts [15]. Malnutrition is associated with the incidence of childhood infections. Malnourished children have a higher risk of diarrhea and an increased severity of diarrhea. Diarrhea causes malnutrition in children because of anorexia, malabsorption, and increased nutrient intake requirements [16]. Malnourished pediatric patients who are hospitalized have a five-fold higher chance of nosocomial infections than pediatric patients with normal nutritional status [17]. This study examines the impact of birth weight on healthcare utilization and costs related to diarrhea in children aged 0-59 months in Indonesia, using BPJS Kesehatan Sample Data for 2017-2022.

METHODS

This research design is cohort retrospective, using secondary data (BPJS Kesehatan Sample Data for the

2023 Child Subset and Environmental Quality Index Report Data from the Ministry of Environment and Forestry of the Republic of Indonesia). The inclusion criteria are individuals born from January 1st to December 31st, 2017, and hospitalized at secondary-level referral health facilities (FKRTL) on the date of birth with INACBGs codes (FKL19) P-8-02 to P-8-17. Incomplete data were excluded from this study.

BPJS Kesehatan performs several stages to reduce the potential sampling bias. It prepared a family sampling frame that contains all sampling units (participants). Data is constructed based on a combination of two first-level health facilities (FKTP) variables, which involve all family members who have never received health services (category 1), families have participants who have received services at FKTP (category 2), and families have participants who have received services at FKRTL (category 3). Lastly, it uses stratified random sampling to select family samples, where one family unit is selected from each stratum.

The independent variable in this study is the individual's birth weight, which is created as a dummy variable based on the INACBGs code. The LBW category is coded "1" based on the INACBGs code for neonates with birth weight group-1 birth weight <1,000 grams (codes P-8-02, P-8-03), group-2 birth weight 1,000—1,499 grams (codes P-8-04, P-8-11), group-3 birth weight 1,500—1,999 grams (codes P-8-05, P-8-12), and group-4 birth weight birth 2,000-2,499 grams (codes P-8-06, P-8-13). Meanwhile, the normal birth weight category is coded "0" based on the INACBGs code for those with group-5 birth weight, birth weight >2,499 grams (codes P-8-08, P-8-14, P-8-15, P-8-16, P-8-17).

The dependent variables are the number of outpatient and inpatient visits, hospital length of stay, and the cost over five years because of diarrhea (ICD10 codes A09.0 to A09.9) served at FKRTL for primary and secondary diagnosis. From age 0 to 59 months, we determined the number of outpatient and inpatient visits for each individual due to diarrheal disease.

An analysis was conducted to test the relationship between birth weight and several controlled variables. This study uses Negative Binomial Regression to analyze the estimated rate ratio for outpatient and inpatient visits and the Length of Stay (LOS). Gamma regression was used to analyze the accumulated outpatient and inpatient costs of diarrheal disease based on birth weight. Analysis was carried out using STATA version 16.

This research has obtained ethical approval from The Research and Community Engagement Ethical Committee Faculty of Public Health, Universitas Indonesia no: Ket-278/UN2.F10.D11/PPM.00.02/2024.

RESULTS

The total sample in the child Subset in the 2015-2022 BPJS Membership Sample Data was 263,867 participants. After selecting samples based on inclusion criteria: children born from January 1st, 2017, to December 31st, 2017, and receiving services with INACBGs codes P-8-02 to P-8-17, 3,191 participants were obtained. Next, incomplete data (missing values), including unknown residence (code: 99) or recorded birth weight groups based on different INACBGs codes, was excluded, totaling 16 participants. Thus, the research sample of 3,175 participants was obtained.

The respondents' characteristics indicate that 15.53%, or 493 children had LBW. The majority are male, 45.09%. Most mothers were 25-29 years old: 40.03%, and at least <20 years old, 4.63%. Most of the research samples came from the Wage Recipient Workers (PPU) segment, at 52.98%, and the least was from the Beneficiaries of Health Insurance Contribution Assistance (PBI) segment, at 30.11%. Most of the research samples were participants in treatment class 3, totaling 1,385 children (43.62%). More children live in district areas (2,015 children) than in city areas (1,160 children). The majority come from or live in regional area 1, as much as 41.25% (Table 1).

The total number of outpatient visits for 5 years in under five children caused by diarrhea was 446 visits, and the total number of inpatient visits was 572, with an average length of stay for each visit of 3.37 days. The accumulated cost of outpatient claims at FKRTL for 5 years caused by diarrhea was Rp 85,844,400 with an average of Rp 27,037 per child. The accumulated cost of

hospitalization was Rp 1,209,731,124 with an average of Rp 381,017 per child (Table 2).

Table 1. Sample characteristics

Variable	n	%
Birth weight		
Normal birth weight	2,682	84.47
Low birth weight	493	15.53
Gender		
Male	1,781	56.09
Female	1,394	43.91
Mother's age (years)		
<20	147	4.63
20—24	843	26.55
25—29	1,271	40.03
30—34	679	21.39
≥35	235	7.40
Membership segment		
PBI	956	30.11
PBPU	537	16.91
PPU	1,682	52.98
Treatment class		
Class 1	901	28.38
Class 2	889	28.00
Class 3	1,385	43.62
Residence		
City	1,160	36.54
Regency	2,015	63.46
Regional		
Regional 1	1,313	41.35
Regional 2	565	17.80
Regional 3	951	29.95
Regional 4	174	5.48
Regional 5	172	5.42

PBI: *penerima bantuan iuran* (beneficiaries of health insurance contribution assistance); PBPU: *pekerja bukan penerima upah* (non-receiving wage worker); PPU: *pekerja penerima upah* (workers with salary)

Table 2. Number of outpatient visits, number of inpatient visits, number of hospital length of stay (days), accumulated outpatient and inpatient costs because of diarrhea for five years at FKRTL

Variable	Total for 5 years	Average	Standard deviation	Minimum	Maximum
Number of outpatient visits	446	0.14	0.52	0	8
Number of inpatient visits	572	0.18	0.59	0	14
Number of hospitalization days	1,926	3.37	1.98	1	19
Accumulated outpatient costs	Rp 85,844,400	Rp 27,037	Rp 101,141	0	Rp 1,528,800
Accumulated inpatient costs	Rp 1,209,731,124	Rp 381,017	Rp 1,434,264	0	Rp 40,026,600

Birth weight was significantly associated with the number of outpatient visits and the number of days of hospitalization in FKRTL due to diarrhea in children under five. LBW children made 1.42 times more

outpatient visits and experienced 1.51 times more inpatient days than children born with normal birth weight. Birth weight was not significantly associated with the number of outpatient visits and accumulated

Table 3. Determinants of various dependent variables according to birthweight, mother's age,

Variable	Outpatient visits		Inpatient visits		Number of hospitalization days		Accumulated outpatient costs		Accumulated inpatient costs	
	Coefficient	IRR	Coefficient	IRR	Coefficient	IRR	Coefficient	IRR	Coefficient	IRR
Birth weight										
NBW					Ref.					
LBW	0.349**	1.42	0.296*	1.34	0.414**	1.51	0.267	1.31	0.185	1.20
Gender										
Male					Ref.					
Female	-0.191	0.827	0.363***	0.69	-0.385***	0.68	-0.304**	0.74	-0.484***	0.62
Mother's age at birth (years)										
<20					Ref.					
20-24	0.080*	2.24	0.132	1.14	0.111	1.12	0.934**	2.54	-0.176	0.84
25-29	0.859*	2.62	0.258	1.29	0.262	1.29	0.822	2.27	-0.653	0.94
30-24	0.610	1.84	0.011	1.01	0.0597	1.06	0.641	1.89	-0.359	0.69
≥35	0.631	1.88	-0.159	0.85	-0.190	0.83	0.472	1.60	-0.451	0.64
Membership segment										
PBI					Ref.					
PBPU	0.473**	1.60	0.717***	2.05	0.757***	2.13	0.464*	1.59	0.755***	2.13
PPU	0.473***	5.29	1,208***	3.35	1,053**	2.87	1.97***	7.17	1,269***	3.56
Treatment class										
Class 1					Ref.					
Class 2	0.473**	1.18	0.124	1.13	-0.0104	0.98	0.0106	1.01	0.0017	1.00
Class 3	1,667***	3.35	0.497	1.64	0.261	1.29	1,404**	4.07	0.305	1.36
Residence										
City					Ref.					
Regency	-0.659***	0.52	-0.251**	0.78	-0.203	0.816	-0.807***	0.45	0.301**	0.74
Regional residence										
Regional 1					Ref.					
Regional 2	-0.056	0.95	-0.154	0.86	-0.0524	0.95	-0.079	0.92	0.0002	1.00
Regional 3	-0.253	0.78	-0.086	0.92	0.0680	1.07	-0.372*	0.69	0.031	1.03
Regional 4	-0.442	0.64	0.036	0.96	0.368	1.45	-0.781**	0.46	0.283	1.33
Regional 5	-0.066	0.94	0.0353	0.97	-0.0798	0.92	-0.0837	0.92	-0.145	0.86
WQI	-0.0387***	0.96	-0.036***	0.96	-0.047***	0.95	-0.084***	0.96	-0.048***	0.95
Constant	-1,866**		-0.796		1,060		10.13***		14.76***	
N	3,175		3,175		3,175		3,175		3,175	

Robust standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1

NBW: normal birth weight; LBW: low birth weight; PBI: *penerima bantuan iuran* (beneficiaries of health insurance contribution assistance); PBPU: *pekerja bukan penerima upah* (non-receiving wage worker); PPU: *pekerja penerima upah* (workers with salary); WQI = Water Quality Index

claims costs due to diarrhea over 5 years. However, on average, the number of inpatient visits and accumulated claim costs were higher in children with LBW history.

The number of outpatient visits at FKRTL due to diarrheal disease over 5 years was also significantly associated with membership segment, class of care, area of residence category, and water quality index. Children from the PBPU and PPU segments had more outpatient visits than children from the PBI segment. Children from treatment class 3 had the highest number of outpatient visits, 5.29 times more than children from treatment class 1. Children living in districts had fewer outpatient visits than children living in cities.

The number of inpatient visits at FKRTL due to diarrheal disease was significantly associated with the child's gender, membership segment, region of

residence, and water quality index. Girls had 0.69 times fewer inpatient visits than boys. Children from the PBPU and PPU segments had more outpatient visits than children from the PBI segment. Children living in districts have fewer inpatient visits than children living in cities.

The length of stay over 5 years in FKRTL due to diarrheal disease was significantly associated with birth weight, gender, membership segment, and water quality index. Girls had 0.68 times fewer days of hospitalization than boys. PPU and PBPU segments had more days of hospitalization than children with PBI membership segments.

Accumulated outpatient and inpatient claim costs were significantly associated with child gender, membership segment, residence category, and water quality index. Girls had lower accumulated outpatient and inpatient costs than boys. The PBPU and PPU

segments had higher accumulated inpatient costs than the PBI segment. Children living in districts had lower accumulated outpatient and inpatient claim costs than children living in urban areas, in line with outpatient and inpatient visit numbers (**Table 3**).

DISCUSSION

From the selected samples, we knew that the percentage of babies born with a body weight of less than 2,500 grams (LBW) was 15.53%. This number is higher than the 2017 Indonesian Demographic and Health Survey (DHS) findings, with an LBW percentage of 7.1%. The difference is that the sampling in this study was limited to children born in FKRTL with INACBGs codes -8-02 to P-8-17. So, it does not include the number of births carried out at FKTP. In addition, 53.1% of the childbirth costs were paid out-of-pocket. JKN/KIS funds only 34% of all births in health facilities [18].

Multivariate analysis using negative binomial regression showed that birth weight is significantly associated with the number of outpatient visits by pediatric patients over five years at FKRTL caused by diarrheal disease. Children with a history of LBW had 42% more outpatient visits at FKRTL over five years because of diarrhea than children born with normal weight. The child's number of incidents and severity of diarrhea may be related to this. A history of LBW can be at risk of causing various health problems, one of which is infectious disease. Babies with a history of LBW may have a lower immune system than children born with a normal weight, which increases the child's risk or susceptibility to infectious diseases [10]. Children with a history of LBW will experience 33% more days with diarrhea than children born with normal weight [9].

Birth weight was significantly associated with the length of stay because of diarrheal disease at FKRTL. Children with a history of LBW will experience 51% more days of hospitalization over five years than children born with normal weight. According to the research, there is a 1.10-fold increase in the risk of children being hospitalized due to diarrhea for every 500 gram decrease in birth weight [8].

The analysis also showed that birth weight was not significantly associated with the number of inpatients for children with diarrhea over five years at FKRTL. However, even though it is not associated considerably, children with a history of LBW exhibit a higher number of inpatient visits and accrue greater outpatient and inpatient costs than children born with normal weight. A higher number of inpatient visits for children with a history of LBW, apart from increasing

the cost of BPJS claims can also affect the amount of non-medical costs, such as transportation and income loss for the child's parents. The average direct non-medical costs for hospitalization because of diarrhea in Indonesia are US\$4.90, and indirect costs are US\$9.90 [19]. As the number of hospitalization visits increases, the accumulated non-medical costs will also increase.

Birth weight also did not show a significant association with the accumulated outpatient costs and accumulated inpatient costs for pediatric patients because of diarrhea at FKRTL for five years. However, the accrued outpatient and inpatient costs are higher than the accumulated costs in patients with a history of normal birth weight. Girls had a significant association with the accumulated outpatient and inpatient costs of pediatric patients diagnosed with diarrhea at FKRTL for five years. Boys are more likely to be exposed to conditions that cause diarrhea because they tend to play outdoors, which could be a contributing factor [20]. However, gender inequality can also play a role in this, as it leads to differences in how mothers seek treatment for diarrhea in boys and girls [21].

The membership segment was also associated with the accumulated outpatient and inpatient costs of pediatric patients diagnosed with diarrhea at FKRTL over five years. The Non-Wage-Earning Workers (PBPU) and Wage-Earning Workers (PPU) segments show a significant increase in visits, days of care, and accumulated care costs compared to the PBI participant segment. Meanwhile, although there was no significant relationship based on treatment class, participants from treatment class 3 had more visits, more days of treatment, and more accumulated treatment costs than those from treatment class 1.

The area of residence was associated with accumulating outpatient and inpatient costs for pediatric patients because of diarrhea at FKRTL over five years. Children in district areas have accumulated outpatient costs 0.45 times lower, and inpatient costs 0.74 times lower than children in city areas. The accumulated BPJS Health claim costs align with the number of visits in the analysis results, where children who live in districts with fewer outpatient and inpatient visits than children who live in cities. In line with other research, children who live in rural areas have a lower chance of experiencing diarrhea than children who live in urban areas, and people who live in urban areas are 1,493 times more likely to have outpatient visits than people who live in rural areas [22,23]. Better health facilities in urban areas may result in variations in visitation rates and overall expenses, highlighting the ongoing disparity in utilizing health services in Indonesia [23]. Based on INACBGs

rates, the study revealed that Region 1, consisting of the Special Region of Yogyakarta, West Java, Central Java, East Java, and DKI Jakarta, has the highest number of outpatient and inpatient visits.

The analysis also showed that the water quality index is significantly associated with outpatient visits and accumulated claim costs over five years. The coefficient value for the water quality index indicates a negative relationship, which means that an increase of 1 unit in the water quality index will decrease visits and total treatment costs related to diarrhea. Researchers found from the analysis results that children born with a history of LBW had more outpatient visits and a higher average number of days of hospitalization than children with a normal birth weight. Thus, children with LBW require more attention, especially in preventing diarrhea, such as through improved sanitation, exclusive breastfeeding for the first six months of life, and rotavirus vaccination. However, because of several limitations in this study, further research is needed to confirm this impact.

There are some limitations to this study. One limitation of this study is that the dataset does not include an important variable: the child's birth weight in grams. In this study, we categorized the child's weight category based on the birth weight group in the INACBGs code based on when the children were admitted on the date of birth. Second, the study could only classify the sampling for children born at FKRTL. Therefore, this study could not include children born normal at FKTP. BPJS Kesehatan sample data is one of the national datasets with a complete data source, including visit history and claim costs in individual units. It would be better if, in the future, BPJS Kesehatan included a variable of birth weight in grams or birth weight category for deliveries at FKTP. Researchers could use BPJS sample data to conduct further research, examining the impact of birth weight on various numbers of visits and pediatric care costs more comprehensively. Third, the study focused on analyzing data limited to services at FKRTL and performed a cost analysis using a third-party payer perspective from BPJS Kesehatan. From the patient's perspective, non-medical costs include transportation and caregivers' income loss for child admission.

CONCLUSION

Birth weight, gender, membership segment, treatment class, area of residence, and water quality index significantly influenced the number of outpatient visits for children aged 0 to 5 years at FKRTL caused by diarrhea. Children born with a history of LBW had

more outpatient visits, inpatient visits, length of stay, and accumulated outpatient and inpatient costs compared to children born with a normal weight.

REFERENCES

1. Anjorin SS, Stephenson B Ojeifo. The Risk of Infectious Diseases Associated with Birth-weight: a Systematic Review and Meta-analysis. *International Journal of Scientific & Engineering Research*. 2017;8(5):1671–9.
2. UNICEF. UNICEF DATA. 2023 [cited 2024 March 7th]. Under-five Mortality. Available from: [Website]
3. WHO. Pneumonia in children [Internet]. 2022 [cited 2024 March 7th]. Available from: [Website]
4. WHO. Diarrhoeal disease [Internet]. 2024 [cited 2024 March 7th]. Available from: [Website]
5. Tim Riset Kesehatan Dasar 2018 (Indonesia), editor. Laporan nasional RISKESDAS 2018. Jakarta: Kementerian Kesehatan, Republik Indonesia, Badan Penelitian dan Pengembangan Kesehatan; 2019. 628 p.
6. Kemenkes RI. Profil Kesehatan Indonesia Tahun 2022. Jakarta: Kementerian Kesehatan Republik Indonesia; 2023.
7. Mathad V, Naik V, Mahantashetti NS. Sociodemographic, biological and cultural factors affecting infant morbidities: A longitudinal study in rural Karnataka. *Clinical Epidemiology and Global Health*. 2021 April;10:100704.
8. Hviid A, Melbye M. The Impact of Birth Weight on Infectious Disease Hospitalization in Childhood. *American Journal of Epidemiology*. 2007 February 19th;165(7):756–61.
9. Lira PIC, Ashworth A, Morris SS. Low birth weight and morbidity from diarrhea and respiratory infection in northeast Brazil. *The Journal of Pediatrics*. 1996 April;128(4):497–504.
10. Raqib R, Alam DS, Sarker P, Ahmad SM, Ara G, Yunus M, et al. Low birth weight is associated with altered immune function in rural Bangladeshi children: a birth cohort study. *The American Journal of Clinical Nutrition*. 2007 March;85(3):845–52.
11. UNICEF. UNICEF DATA. 2023 [cited 2024 March 8th]. Low birth-weight. Available from: [Website]
12. Jana A, Dey D, Ghosh R. Contribution of low birth weight to childhood undernutrition in India: evidence from the national family health survey 2019–2021. *BMC Public Health*. 2023 July 12th;23(1):1336

13. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of Low-Birth Weight with Malnutrition in Children under Five Years in Bangladesh: Do Mother's Education, Socio-Economic Status, and Birth Interval Matter? Islam FMA, editor. *PLoS ONE*. 2016 June 29th;11(6):e0157814.
14. Black R, Laxminarayan R, Temmerman M, Walker N. Disease Control Priorities, Third Edition (Volume 2): Reproductive, Maternal, Newborn, and Child Health [Internet]. Washington, DC: World Bank; 2016 [cited 2023 December 12th]. Available from: [[Website](#)]
15. Saunders J, Smith T. Malnutrition: causes and consequences. *Clinical Medicine*. 2010 December;10(6):624–7.
16. Walson JL, Berkley JA. The impact of malnutrition on childhood infections. *Current Opinion in Infectious Diseases*. 2018 June;31(3):231–6.
17. Niseteo T, Hojsak I, Kolaček S. Malnourished children acquire nosocomial infections more often and have significantly increased length of hospital stay. *Clinical Nutrition*. 2020 May;39(5):1560–3.
18. Mazda Novi Mukhlisa, Indra Yoga, Nana Tristiana, Windi Haryani, Rosa Estetika. Evaluasi Implementasi Jaminan Persalinan (Jampersal) di Indonesia. *Jurnal Ekonomi Kesehatan Indonesia* [Internet]. 2020;(Vol 5, No 2 (2020)). Available from: [[Website](#)]
19. At Thobari J, Sutarman, Mulyadi AWE, Watts E, Carvalho N, Debellut F, et al. Direct and indirect costs of acute diarrhea in children under five in Indonesia: Health facilities and community survey. *The Lancet Regional Health - Western Pacific*. 2022 February;19:100333.
20. Rahman A, Hossain MdM. Prevalence and determinants of fever, ARI, and diarrhea among children aged 6–59 months in Bangladesh. *BMC Pediatrics*. 2022 December;22(1):117.
21. Terefe B, Mulat B, Shitu K, Assimamaw NT. Individual and community factors associated with medical treatment-seeking behavior for childhood diarrhea among the Gambian mothers: evidence from the Gambian demographic and health survey data, 2019/2020. *BMC Public Health*. 2023 March 28th;23(1):579.
22. Apanga PA, Kumbeni MT. Factors associated with diarrhoea and acute respiratory infection in children under-5 years old in Ghana: an analysis of a national cross-sectional survey. *BMC Pediatrics*. 2021 December;21(1):78.
23. Wulandari RD, Laksono AD, Nantabah ZK, Rohmah N, Zuardin Z. Hospital utilization in Indonesia in 2018: do urban–rural disparities exist? *BMC Health Services Research*. 2022 December;22(1):491.